



American Mobile Satellite Corporation

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18802 Sunrise Boulevard  
Reston, VA 22091

Telephone 703/758-6150  
Fax 703/758-6111

Lon C. Levin  
Vice President and Regulatory Counsel

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September 27, 1994

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

By Hand Delivery

Mr. William F. Caton  
Acting Secretary  
Federal Communications Commission  
1919 M Street, N.W.  
Washington, D.C. 20554

Re: CC Docket No. 92-166

Dear Mr. Caton:

I am writing on behalf of AMSC Subsidiary Corporation, an applicant in the above-referenced proceeding, in response to the "Joint Proposal and Settlement Agreement" filed September 9, 1994 by four of the other applicants, Constellation Communications, Inc., Mobile Communications Holdings, Inc., Motorola Satellite Communications, Inc. and TRW Inc. The proposal of the four applicants purports to eliminate any mutual exclusivity among the applicants proposing to operate MSS systems using nongeostationary satellites.

AMSC believes that the Commission has accorded too much credit to the claims of the LEOs that their technology is unique and superior to that of geostationary satellite systems. As we have discussed previously, the record in fact demonstrates that LEO technology is at best not much different from that of geostationary satellites and is at worst significantly inferior, particularly with respect to spectrum efficiency and financability.

The point that we want to emphasize, however, as the Commission considers the applicants' joint proposal and strives to meet its October deadline for new rules, is that a grant to AMSC to operate in these bands using CDMA technology permits the Commission to "hedge its bet" on the LEOs being able to go forward. Our proposal to use these bands to add spectrum to our follow-on satellites is the most practical and realistic proposal of all the applicants and the one most likely to put the spectrum to use in service to the American public. Moreover, AMSC's

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willingness to operate CDMA permits the Commission to license AMSC without harming the prospects for LEO systems.

Notwithstanding their recent proposal, it is apparent that the LEOs still face substantial obstacles. The proposal itself makes an enormous assumption that the LEOs will have access to hundreds of megahertz of prime feederlink spectrum. This feederlink issue highlights the spectrum inefficiency of LEO systems and the problems that are likely to occur in attempting to coordinate their operation in other regions. The issue of LEO access to feederlink spectrum must be resolved at least domestically before the Commission considers limiting access to these mobile-link bands by geostationary satellite systems.

The proposal also leaves unresolved how the parties will share the burden of using the spectrum at 1610-1626.5 MHz that is impaired by continued operation of the Russian Glonass system. This "agreement to agree" demonstrates that the joint proposal does not truly resolve problems of spectrum sharing among the applicants and foretells considerable additional delay in developing any consensus among the LEOs.

The joint proposal also seeks to reduce the financial showing required of the applicants and to permit applicants to stretch their launch of complete systems to more than eight years after initial licensing. There is mounting evidence that many if not all of the LEO proposals will not go forward. A recent report by Mitre Corp. prepared for the European Commission discusses the serious problems that confront many of the LEOs. See Communications Daily, "No Big LEOs Will be Fully Operational By End of Century, U.S. is Told," July 27, 1994, pp. 6-7, and "Mitre Criticizes Globalstar Estimates, Motorola Claims," August 4, 1994, pp. 3-4. In addition to the enormous costs of the more expensive proposals (Motorola's proposal would cost \$6 billion to construct and maintain in operation for three years), Inmarsat has recently announced plans to move forward with its own 12-satellite Intermediate Circular Orbit system. Brazil has announced plans for a LEO MSS system serving equatorial regions and Russia has announced plans for its own LEO MSS system, all intending to operate in these same bands. See Communications Daily, "Brazil Plans 'Equatorial Communication System' Using 8 LEO Satellites," August 15, 1994, p. 2. See also Washington Post, "A Glut Around the Globe," September 12, 1994, p. D1.

All of these systems are at least several years away from being considered "real" by anyone other than their promoters. AMSC, by contrast, has raised over \$650 million and is a few short months away from the launch of the U.S. MSS system, deploying a high-power satellite dedicated to providing MSS to the United States. The availability of sufficient spectrum for the U.S. system, however, remains problematic due to the difficulty of sharing MSS spectrum with Inmarsat, Canada, Mexico and others. This spectrum shortage makes AMSC's access to the bands at issue here extremely important to our ability to provide

service to the U.S. public. At the same time, AMSC does not seek to block the LEOs; by operating CDMA, the one or two or more LEOs that may be able to secure financing and resolve their technical issues will be able to go forward regardless of the licensing of AMSC to use the band.

The September 9 proposal also highlights the fallacy that LEOs provide global coverage. The four applicants propose to reduce their global coverage requirement to no more than 18 hours a day and only in areas outside the polar region. This demonstrates the extent to which a system of three or four geostationary satellites in fact will provide better global coverage than the LEO systems.

Very truly yours,

A handwritten signature in cursive script, appearing to read "Lon C. Levin".

Lon C. Levin

cc: Attached Service List

**Mitre Briefing****NO BIG LEOs WILL BE FULLY OPERATIONAL BY END OF CENTURY, U.S. IS TOLD**

System designs and marketing plans of several big low-earth-orbiting satellite systems -- including Iridium and Globalstar -- didn't pass stern Mitre technical evaluation presented to State and Defense Dept. officials Aug. 2. We covered briefing, which was sought by State Dept. and was based on Mitre's recent study, originally commissioned by European Space Agency (ESA), called *A Reevaluation of Selected Mobile Satellite Systems* (CD July 27 p6). Surprise of briefing was very high marks from study co-author Neal Hulkower for Ellipsat and TRW's Odyssey systems, which have been viewed by some as inferior because they haven't attracted as much capital as Loral and Motorola. On constellation, Hulkower said: "I don't think these guys are alive. Frankly, they didn't have a credible design." Regardless of praise for Ellipsat and Odyssey, he said none of proponents would reach goal of providing service by

1998. "No Big LEOs will be fully operational by the end of this century," he said, because of overly aggressive construction and licensing schedules.

Ellipsat "has matured into a serious contender" over last year, Hulkower told officials. He cited company's hiring of "brilliant" satellite system design team and agreements with credible industrial powerhouses such as Westinghouse and, more recently, IBM and InterDigital. Hulkower credited Ellipsat as being only "truly market-driven system," but he criticized Iridium as system "of, by and for engineers" not designed with viable market in mind. Ellipsat's latest plan is to launch satellites in one of its 2 proposed orbital planes and begin providing service and generating revenues to finance deployment of 2nd plane. In contrast, Iridium would have to launch all 66 of its satellites before system would operate. On down side, he said Ellipsat's \$1,200 handset would be too expensive.

Hulkower said TRW's Odyssey system design is "most advanced in development... It's very do-able." Ironically, company has been seeking to delay FCC licensing process. He said TRW could finance project itself if it wanted to, so finance probably isn't reason for strategy. "I have a friend there that tells me they have turned down many offers for investment," he said. He speculated that delaying strategy -- including threats of lawsuits if construction waivers are granted to Motorola and Globalstar to begin construction before licensing -- were planned simply to keep others from gaining edge. TRW "wants to team with an operator. That's why they were in bed with Inmarsat... hoping to be Project-21," he said.

Despite being best financed at moment, Iridium is "least viable" of proposed systems, Hulkower said, because of its tremendous cost (more than \$4 billion), questionable market of high-end business users, unnecessarily complex design. He said biggest problem with design is "single point failures" that exist because of lack of redundancy caused by overzealousness of engineers. Simply put, Hulkower said, because system design is so complex and expensive, Motorola couldn't afford to build in redundant features for reliability. Either way, he said, Motorola won't lose money on Big LEOs because it will make handsets for other operators: "They know what they're doing in handsets, but not in space." On positive side, one thing Motorola engineers did well was to increase link margin to acceptable level, and project is providing lots of jobs to industry that's depressed, Hulkower said. However, bottom line still is that Iridium "has failure written all over it several different ways."

Globalstar didn't impress Hulkower and fellow study authors much more than did Iridium. He said Globalstar's "critical problem" is that it plans to produce more than 50 satellites at rate that has never been done before at facility in Italy that isn't even built. He characterized Globalstar's satellite design as "immature" and said: "They couldn't convince us they were going to do what they said they would with what they had." Third weak link is ground segment, which he said all proponents needed to concentrate more on, but which is area where Globalstar is furthest behind. Globalstar announced partial \$275 million in financing, but Hulkower said: "They're a long way from being financed. A long way."

## **Study for ESA**

### **MITRE CRITICIZES GLOBALSTAR ESTIMATES, MOTOROLA CLAIMS**

Globalstar has underestimated cost of its satellites as much as 62% and Motorola's Iridium big low-earth-orbiting (LEO) satellite doesn't live up to its perfect coverage claims, Mitre concluded in study conducted for European Space Agency (ESA). Mitre is not-for-profit independent research entity, originally established by MIT. Its main client is U.S. govt. Mitre "Sensibility Analysis" said Globalstar satellites would cost more than \$1.6 billion, compared with company's estimate of \$640 million. It didn't include analysis of Globalstar's 200 planned earth stations, which opponents have said will cost more than company has budgeted. Other Big LEOs were within 5-10% of their estimated satellite costs, it said, but "except for Iridium, proposers' estimates of [total] system costs have increased by as much as a factor of 2" since they were first proposed, according to most recent of study's 3 parts, "Reevaluation" of big LEO systems concluded in Feb. Study also includes (1) overall examination of mobile satellite industry and (2) earlier "Evaluation" of Big LEOs, both done in 1992.

All Big LEOs coverage claims could be verified, study said, but "our results for Iridium indicate that although perfect coverage to the entire globe is achievable with the constellation parameters, the relative formation of the satellites changes as the satellite orbits are propagated, resulting in total outages up to 24 minutes in a 24-hour period. Such outages may be overcome if the satellites' orbital parameters are precisely maintained, as Motorola claims. However, the fuel penalty for such adjustments may be quite large." Study said there were holes in coverages of other proposed constellations, including: (1) Ellipsat's degraded coverage at latitudes below 50° S. (2) Globalstar's inability to cover polar regions adequately. (3) Odyssey's outages in far northern and southern regions.

"Evaluation" portion of study says Motorola will spend 65% more than its planned \$571 million for launches, which will cost \$1.6 billion. However, estimates were made using 77-satellite constellation, which company has abandoned in favor of 66 satellites and didn't include use of Russian Proton and Chinese Long March launches, which it has made deals for. Mitre also said Globalstar launch costs were underestimated. "Even with a significant contractor discount, the Mitre total of \$360 million greatly exceeds the Loral estimate" of \$181 million, it said.

Study identified some hurdles for all Big LEOs in areas of spectrum allocation and management, and interference control. It said: "Delay in obtaining national or regional spectrum assignments, or difficulties in obtaining necessary licenses for gateway earth stations, could also seriously affect schedules and alter the financial status of proposed systems. A delay in system operation for this reason could also have financial implications." It said an-

other potential stumbling block is earth station technology: "It appears to us that the complexity of the earth stations has been generally underestimated by the proposers. This complexity involves the tracking, handoff and signal integrity for the multiple satellite constellations, and also involves the question of baseband interfaces and general access to the PSTNs [public switched telephone networks] with which these systems operate... These stations are quite complex and expensive."

**INPE's ECO-8 Project****BRAZIL PLANS 'EQUATORIAL COMMUNICATION SYSTEM' USING 8 LEO SATELLITES**

Brazil's Instituto Nacional de Pesquisas Espaciais (INPE) announced plans to develop \$264-million equatorial low-earth-orbit (LEO) satellite system using 8 Brazilian-made satellites. Equatorial Communication System, called ECO-8, will be fully operational by 2000 with capacity to serve 1,200 simultaneous users, INPE said. It will begin service to Brazil and other countries after launches begin in 1999. System is designed primarily to serve remote areas of Brazil, but footprints under orbiting satellite will allow it to serve all of Africa, plus Australia, India, Indonesia, most of China. ECO-8's planned coverage area from 2,000-km operating altitude can cover regions in equatorial belt from 30° N to 30° S, including southernmost U.S. states from Fla. to Cal. Locator services also will be provided.

INPE said ECO-8 system has operational and cost advantages over other proposed Big LEO and geostationary mobile satellite service (MSS) systems, because equatorial orbit "has the characteristics of providing coverage of a given equatorial location in all the satellite passes... Therefore, by placing various satellites in the same equatorial orbit, it is possible to guarantee that there will always is one satellite visible by the user." INPE said controlling satellites will be easier than with other constellations because operators will have total knowledge of satellite passes, making it possible to simplify tracking system antennas and to achieve performance advantages. It said there will be no interruption when satellite disappears below horizon. Simplified software easily can find location of next passing satellite since it's in same plane. Another advantage for Brazil is proposed use of refurbished Alcantara launch base near equator. (NASA is conducting rocket sounding tests from Alcantara in fall.)

INPE said cost savings are achieved in ECO-8 because of low-weight (280 kg), simple domestically produced satellites and simplified access gateway earth stations. Satellites will be constructed with assistance of Brazilian Complete Space Mission Program. There are no intersatellite links or other on-board processors. INPE said low cost to user (it estimates total cost of about 75¢ per min.) is "considered a must condition to make the system feasible." It said system would be viable even if only rural Brazilians used it: "Large companies, other countries and other users typical of big cities remain as a margin to be added in future expansions of the system."

Potential 100,000 users in Brazil in 2000 will use ECO-8 for variety of services, INPE said, including: (1) "Main" application -- service to mobile user handheld cellular-type phone from fixed location connected to public switched network. (2) Monitoring and control functions such as air traffic control or fleet management using systems location capabilities. (3) Fax services. (4) Paging.



# BUSINESS

## RACE IN SPACE

**H**ere are some of the satellite communications systems proposed or under development:

### ■ Inmarsat

The London-based communications consortium plans to build a \$2.6 billion system using 12 satellites, orbiting in two planes around Earth, that would link hand-held phones. Such units would send calls directly to the satellites, for relay to ground stations. Once a satellite descended below the horizon, a call would be automatically transferred to another satellite so the conversation would not be disrupted. Inmarsat claims a system such as this would be more practical than one using large numbers of satellites.

### OTHER DEALS:

#### ■ Globalstar

Worldwide voice, data, fax and paging services using 48 low-earth-orbiting satellites.

#### ■ Teledesic

A worldwide network of 840 satellites would offer voice, data, fax and two-way video communications.

#### ■ Iridium

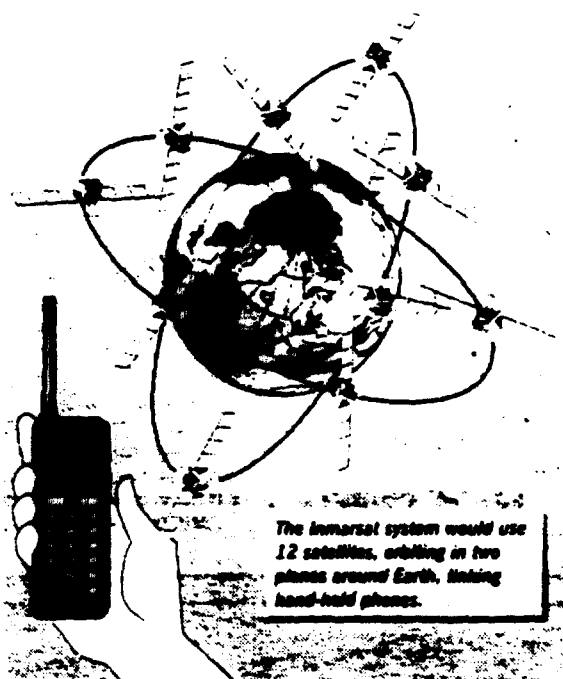
66 satellites would offer worldwide voice, data, fax and paging services.

#### ■ American Mobile Satellite Corp.

Satellite network would provide voice, data, fax and two-way messaging throughout North America.

#### ■ Spaceway

Dual-satellite system would provide voice, data and two-way videoconferencing in North America.



## A Glut Around the Globe?

### Satellite Phone Plans May Produce More Than the Traffic Can Bear

By Sandra Segewara  
Washington Post Staff Writer

**W**hat if they built a multibillion-dollar satellite communications system and nobody called?

That's the question facing companies lining up to launch competing satellite networks that would let customers use hand-held telephones anywhere in the world.

On Friday, Inmarsat, a London-based communications consortium, signaled its own confidence by announcing it was setting up an affiliate company to build a \$2.6 billion system of 12 satellites. Service would begin in 1990.

Inmarsat plans to invest \$150 million in the venture. Inmarsat's biggest member, Bethesda-based Comsat Corp., is considering a major investment as well, a Comsat executive said. The new company

hopes to raise \$1 billion from Inmarsat members by January.

Inmarsat joins a crowded field of companies that predict large numbers of customers will pay premium dollars to use wireless phones that would work in a remote village in Thailand, an Alaskan oil field or any other place not served by cellular phones.

Conventional satellites orbit too high in space to be reached by a hand-held phone. But now, at least eight systems in which satellites would orbit low enough to link to hand-held phones have been proposed, says Michael French, managing editor of *Satellite Week*, an industry journal. "People can smell the money," he said.

But the question is, will there will be enough customers? It will cost hundreds of millions to billions of dollars to build the satellites and put them in orbit. Millions of people are going to have to flock to hand-

See SATELLITE, D6, Col. 1

# Satellite Phone Projects Proliferate

**SATELLITE, From D1**

held phone service if the companies are to succeed financially.

Some analysts, such as Silver Spring consultant Harold Shostack, think all these projects will flop. He says the industry is in a "speculation-driven bubble," comparing it to the real estate speculation in New York and Japan in previous years. "The only question is when and how it will burst," he said.

Although the world has many underdeveloped areas that badly need telephone service, the systems under development are generally too costly for those customers, Shostack said. The hand-held phones, which must be able to link directly to satellites hundreds or thousands of miles in the sky, are expected to cost more than \$1,000 each. Satellite service would run about \$1 to \$3 per minute, compared with an average of less than 30 cents for cellular.

The biggest targeted market is the business executive on the move. But Shostack contends that there are few such people who travel to remote areas where there are no communications, and by the end of the decade, when most of these systems are to be operational, almost every region will have access to conventional or cellular telephones.

Other analysts are less pessimistic, but still skeptical. "There is enough business for two, but not for six or seven," said Mark Lowenstein of the Yankee Group, a Boston-based consulting firm.

But such analysts don't seem to face those writing the checks. Pat McDougal, head of strategic planning at Inmarsat, said, "We've assumed a high level of competition. We've assumed that we would get market shares of less than 50 percent. But we believe that we've come up with a superior product, and that it would be backed by a superior set of operators and investors, and that when we are all operational, we'll be in a good position."

Among the big corporations jockeying in this market are former defense companies that want other business to replace dried-up demand for defense satellites. These include Motorola Inc., with its 68-satellite Iridium system, Loral Corp., Hughes Aircraft Co. and TRW Inc.

The largest system is a \$9 billion, 840-satellite venture backed by Microsoft Corp. Chairman William H. Gates and McCaw Cellular Communications Inc. founder Craig McCaw. But it is targeted at a vastly different market. It would use satellites to link large fixed-site telephone systems for villages

and towns in remote and rural areas.

Inmarsat, a consortium of 75 countries that runs a worldwide satellite communications system for ships, aircraft and vehicles, has long seen this market as the next logical step. But getting the international organization to move quickly in a crowded and competitive market has been difficult.

The group held long debates over the type of system it should build, finally settling on one using relatively high orbits—10 would be operational and two would be "spares." At least two satellites would be over a user at all times, which Inmarsat said would ensure continuous, unobstructed communications.

Under Inmarsat's current structure Comsat would have had to fund 22 percent of the new system's bill. It balked at that, and also worried that Inmarsat was not set up to maneuver quickly against competitors.

The new spinoff was set up to address those concerns. Comsat officials said the company is reviewing the proposal to decide whether to invest. It is also awaiting a decision by federal regulators on whether it can contribute money.

"We certainly believe there is a market for this service," said Chris Leber, a Comsat official.

**CERTIFICATE OF SERVICE**


I, Deniece B. Mayberry, hereby certify that on this 27th day of September, 1994, copies of the foregoing Letter were delivered via hand-delivery (indicated with \*) or by U.S. Mail, postage-prepaid, to the following:

- \* Chairman Reed E. Hundt  
Federal Communications Commission  
Room 814  
1919 M Street, N.W.  
Washington, D.C. 20554
- \* Commissioner James H. Quello  
Federal Communications Commission  
Room 802  
1919 M Street, N.W.  
Washington, D.C. 20554
- \* Commissioner Andrew C. Barrett  
Federal Communications Commission  
Room 826  
1919 M Street, N.W.  
Washington, D.C. 20554
- \* Commissioner Rachelle B. Chong  
Federal Communications Commission  
1919 M Street, N.W.  
Washington, D.C. 20554
- \* Commissioner Susan Ness  
Federal Communications Commission  
1919 M Street, N.W.  
Washington, D.C. 20554
- \* Karen Brinkmann  
Special Assistant  
Office of the Chairman  
Federal Communications Commission  
Room 814  
1919 M Street, N.W.  
Washington, D.C. 20554
- \* Rudolfo M. Baca  
Legal Advisor  
Office of Commissioner Quello  
Federal Communications Commission  
Room 802  
1919 M Street, N.W.  
Washington, D.C. 20554

- \* Byron F. Marchant  
Senior Legal Advisor  
Office of Commissioner Barrett  
Federal Communications Commission  
Room 826  
1919 M Street, N.W.  
Washington, D.C. 20554
- \* Jane F. Mago  
Richard Welch  
Office of Commissioner Chong  
Federal Communications Commission  
1919 M Street, N.W.  
Washington, D.C. 20554
- \* Greg Vogt  
Office of Commissioner Ness  
Federal Communications Commission  
1919 M Street, N.W.  
Washington, D.C. 20554
- \* Kathy Waldman  
Chief, Common Carrier Bureau  
Federal Communications Commission  
Room 500  
1919 M Street, N.W.  
Washington, D.C. 20554
- \* A. Richard Metzger  
Deputy Chief, Common Carrier Bureau  
Federal Communications Commission  
Room 500  
1919 M Street, N.W.  
Washington, D.C. 20554
- \* Scott Harris  
Director  
Office of International Communications  
Federal Communications Commission  
Room 658  
1919 M Street, N.W.  
Washington, D.C. 20554
- \* James R. Keegan  
Chief, Domestic Facilities Division  
Common Carrier Bureau  
Federal Communications Commission  
Room 6010  
2025 M Street, N.W.  
Washington, D.C. 20554

- \* Thomas Tycz  
Deputy Chief  
Domestic Facilities Division  
Common Carrier Bureau  
Federal Communications Commission  
Room 6010  
2025 M Street, N.W.  
Washington, D.C. 20554
  - \* Cecily C. Holiday  
Chief, Satellite Radio Branch  
Federal Communications Commission  
Room 6324  
2025 M Street, N.W.  
Washington, D.C. 20554
  - \* Fern J. Jarmulnek  
Satellite Radio Branch  
Federal Communications Commission  
Room 6324  
2025 M Street, N.W.  
Washington, D.C. 20554
  - \* William Kennard  
General Counsel  
Federal Communications Commission  
Room 614  
1919 M Street, N.W.  
Washington, D.C. 20554
  - \* Robert M. Pepper  
Office of Plans and Policy  
Federal Communications Commission  
Room 822  
1919 M Street, N.W.  
Washington, D.C. 20554
  - \* Donald H. Gips  
Deputy Chief  
Office of Plans and Policy  
Federal Communications Commission  
Room 822  
1919 M Street, N.W.  
Washington, D.C. 20554
- Leslie Taylor, Esquire  
Leslie Taylor Associates  
6800 Carlynn Court  
Bethesda, MD 20817-4302  
(Counsel for Loral Qualcomm)

- \* John T. Scott, III, Esquire  
William Wallace, Esquire  
Robert Halperin, Esquire  
Crowell & Moring  
1001 Pennsylvania Avenue, N.W.  
Washington, D.C. 20004-2505  
(Counsel for Loral Qualcomm)
  
- Dale Gallimore, Esquire  
Counsel  
Loral Qualcomm  
7375 Executive Place, Suite 101  
Seabrook MD 20706
  
- \* Robert A. Mazer, Esquire  
Rosenman & Colin  
1300 19th Street, N.W.  
Suite 200  
Washington, D.C. 20036  
(Counsel for Constellation  
Communications, Inc.)
  
- \* Jill Abeshouse Stern, Esquire  
Shaw Pittman Potts & Trowbridge  
2300 N Street, N.W.  
Washington, D.C. 20037  
(Counsel for Mobile Communications  
Holdings, Inc.)
  
- \* Philip L. Malet, Esquire  
Steptoe & Johnson  
1330 Connecticut Avenue, N.W.  
Washington, D.C. 20036  
(Counsel for Motorola Satellite  
Communications, Inc.)
  
- \* Norman P. Leventhal, Esquire  
Raul R. Rodriguez, Esquire  
Suite 600  
2000 K Street, N.W.  
Washington, D.C. 20006  
(Counsel for TRW, Inc.)

  
Deniece B. Mayberry